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The Cost Competitiveness of Manufacturing in China and India: An Industry and Regional Perspective

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Foreword

This paper was presented at the Conference on “India and China’s Role in International Trade and Finance and Global Economic Governance” organised by ICRIER, Konrad-Adenauer-Stiftung (KAS) and the International Monetary Fund (IMF) held at New Delhi, India from December 6-7, 2007 and is being published by OUP, UK, shortly in a book titled “Emerging Giants: China and India in the World Economy” edited by Barry Eichengreen, Poonam Gupta and Rajiv Kumar.

The emergence of the two Asian giants – India and China is transforming the global economic geography. These two countries have made inroads into every possible industry. Various attempts have been made to explain the competitiveness of these two emerging Asian powerhouses. However, despite the burgeoning pool of literature on India and China, virtually no one has directly compared the competitiveness of the manufacturing sector in the two economies. In an attempt to fill this void, this paper compares the productivity and labour compensation levels between China and India and that too at a disaggregated industry level. Apart from this, it also provides useful insights into spatial distribution of manufacturing activities in the two countries. I sincerely hope that the working paper will enhance the understanding of policy makers, academia and business sector of both the countries.

(Rajiv Kumar)
Director & Chief Executive

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Abstract

This paper focuses on comparisons of productivity, (unit) labor cost and industry-level competitiveness for the manufacturing sector of China and India. We first provide a comparison between India and China using a broad international perspective. We find that China has increased its labor productivity to a level above that of India, but due to a somewhat higher compensation level, China is still somewhat at a disadvantage in terms of unit labor cost in manufacturing relative to India. In the second half of the paper, we make an analysis of industry level differences in productivity, labor compensation and unit labor costs at state and province level in the two countries from the mid 1990s to the early 2000s. We find rapid declines in unit labor cost across industries and provinces in China, but increases in many instances in India. This suggest that productivity and compensation growth have become much more aligned across regions in China whereas this is not (yet) the case in India. We relate these results to differences in the implementation of market reforms between the two countries and removal of barriers to resource mobility eradicating inefficient manufacturing activity.

Keywords: cost competitiveness, manufacturing, India, China, labor productivity
JEL Classifications: O14, J24

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1. Introduction

The large changes in the growth dynamics of the economies of China and India during the past two decades have led to a flood of literature on the competitiveness of the two economies in international and comparative perspective. Strikingly, however, there are very few studies that have gone into a direct comparison of the basic statistical material on output, employment and cost levels between the two economies, in particular not at a detailed industry level. One reason for the limited number of studies in this area may be related to the difficulty, in particular in China, in accessing and using the detailed production statistics for this purpose. Another reason is that there are some major issues of comparability of the statistics between the two countries.

Nevertheless a direct comparison between India and China is of great relevance, not only for policy makers and academia who are interested in understanding the main differences in the sources of growth in both economies. Such comparisons are also of great importance to the business sector, which needs to make crucial decisions on market access and investment opportunities. Such considerations go beyond macro comparisons between the two countries. Such analysis requires detailed insight at industry level and a regional perspective within each of the two countries.

The Conference Board has therefore launched a multi-year research project in the area of comparisons of productivity and (unit) cost measures in the manufacturing sectors of India and China. In Section 2 of the paper we briefly motivate our focus on this topic and describe our approach on the following main factors: productivity, labor compensation and unit labor cost levels.

The work done so far, as reported in the remainder of this paper, involves two aspects. The first is an international comparison of productivity and unit labor cost levels of the two countries in a broader international perspective, which has been carried out in co-operation with the University of Groningen. Section 3 reports on the methodology for international comparisons of productivity making use of industry-specific output purchasing power parities (PPPs) which are used to convert output into a common currency. We motivate our preference for the use of an indirect comparison of productivity for China and India through the United States and Germany respectively. We then integrate this work into a comparison of unit labor cost levels making use of international measures of labor compensation. We find that even though China had somewhat superior productivity levels in manufacturing compared to India in 2002, it was at a slight disadvantage in terms of unit labor cost relative to India due to its slightly higher compensation level,. It is important to recognize that China's productivity advantage relative to India is only very recent.

The second aspect of the work on which this paper reports, focuses the attention on an analysis of regional and industry differences in productivity, labor compensation and unit labor costs across provinces and states in China and India respectively. For this purpose we developed a unique database for 28 industries and up to 30 states and provinces and two benchmark years, one in the early/mid-1990s and one in the early 2000s. In Section 4 we briefly explain our sources and data manipulations for the two countries and discuss our most important findings. We find that India's unit labor cost in national currency has increased over the decade, whereas China's ULC has rapidly declined. This is due to a faster increase in compensation relative to productivity in most Indian industries and states over the decade. In general labor cost and productivity have become much better aligned in China, so that today unit labor cost varies much less than in India. In Section 5 we show that, compared to India, Chinese provinces clearly show both a catch-up (beta-convergence) and regular (sigma) convergence pattern. We speculate that improved market performance in China has contributed to the catch-up and the convergence pattern. Finally, in **section 6** of the paper we summarize our main findings and indicate directions for future research activities in this program.

2. Unit Labor Cost as Competitiveness Measure

In this paper we use a simple competitiveness measure, which is unit labor cost (ULC) defined as the cost of labor required to produce one unit of output. We prefer this measure which takes account of output and inputs, over comparing only the cost of the inputs. For instance, high wages do not mean the same thing in high- and in low-productivity sectors. In low productivity sectors, high wages mean that production may become too costly and jeopardize the long-run profitability of businesses. In high productivity sectors, however, high wages are often compensated by higher output levels per person and can be fully compatible with long-run profitability.

Unit labor cost can be expressed as labor compensation over output, but it is more instructive to observe how ULC is made up of labor compensation per person employed relative to output per employed person. Hence our analysis in this paper focuses primarily on three indicators, average labor compensation (ALC), average labor productivity (ALP), and unit labor cost (ULC). ALC is defined as the ratio of nominal labor compensation (LC)[1] to total number of employees (E), while ALP is obtained as a ratio of gross value added (GVA) to number of employees. Finally, ULC is the ratio of ALC to ALP or simply the ratio of nominal labor compensation to gross value added.

Each of these indicators can be compared across countries, regions, provinces or states. They can also be compared at different levels of economic activity, that is, for the whole economy, for industry groups (sectors) or for specific more narrowly defined industries. Hence the level of ALC, ALP, and ULC for each individual industry *i* and country, province or state *j* can be expressed as follows:

[1] Note we are focusing on total labor compensation and not just total wages or earnings. The latter only represent take-home pay measures which provide an incomplete picture of labor costs. Total labor compensation is a more comprehensive measure of labor cost for the employer. In addition to wages and salaries, labor compensation includes payroll taxes paid by the company, including employer contributions to social security schemes, social benefits paid by employers in the form of children's, spouse's, family, education or other allowances in respect of dependants, payments made to workers because of illness, accidental injury, maternity leave, etc. and severance payments (International Labor Office).

$$ALC_{ij} = LC_{ij} / E_{ij} \tag{1a}$$

$$ALP_{ij} = GVA_{ij} / E_{ij} \tag{1b}$$

$$ULC_{ij} = ALC_{ij} / ALP_{ij} \tag{1c}$$

Aggregation for each country, province or state *j* across industries *i* is as follows:[2]

$$ALC_j = \sum_i^m LC_{ij} / \sum_i^m E_{ij} \tag{2a}$$

$$ALP_j = \sum_i^m GVA_{ij} / \sum_i^m E_{ij} \tag{2b}$$

$$ULC_j = ALC_j / ALP_j \tag{2c}$$

The third dimension in our study is time, as comparisons can be made at between two points in time or on an annual basis. In this context, it is important to note that while labor compensation is expressed in current prices, the time series for output (gross value added) is deflated with output deflators. Thus, in the calculation of ULC, only the denominator (ALP) is expressed in real terms, while the numerator (ALC) is in nominal terms. This is standard practice in studies on competitiveness as ULC is supposed to measure the nominal cost per unit of real output. Hence the unit labor measure represents the current cost of labor per "quantity unit" of output produced. The deflators for China and India are described in more detail in the data description in Annex A.

When making comparisons of unit labor cost levels across countries, the level of wages or labor compensation is converted at the official exchange rate: it represents the cost element of the arbitrage across countries. In contrast, output or productivity relates to a volume measure as it resembles a quantity unit of output. Hence for level comparisons output needs to be converted to a common currency using purchasing power parity instead of the exchange rate, so that comparative output levels are adjusted for differences in relative prices across countries. For an analysis in terms of comparative levels between countries A and B (and leaving out the sign for industries) this implies:

$$ULC^{AB} = [(ALC^{A}/ER^{AB})/ALC^{B}] \;/\; (ALP^{A}/PPP^{AB})/ALP^{B}] \tag{3}$$

where ER^{AB} is the official nominal exchange rate between countries A and B and PPP^{AB} is the purchasing power parity for output in country A relative to country B. Equation (3) can be rewritten to decompose the difference in unit labor cost between country A and country B into three components, i.e., the difference in nominal labor cost per person, the difference in nominal labor productivity (that is unadjusted for differences in price levels) and the differences in relative price levels (ER/PPP):

$$\log (ULC^{A} – ULC^{B}) = \log (ALC^{A}/ER^{AB} – ALC^{B}) – \log (ALP^{A}/ER^{AB} – ALP^{B}) – \log (ER^{AB} - PPP^{AB}) \tag{4}$$

2 To get the national level measures for each of the industries, we use the respective national level data to get the corresponding indicators rather than adding up the industry data across individual states.

All these components contribute in their own way to differences in cost competitiveness between two countries (or without the third term) for comparisons within countries. However, even for tradables, the ULC index should not be interpreted as a comprehensive measure of competitiveness for several reasons. Firstly, ULC measures deal exclusively with the cost of *labor*. Even though labor costs account for the major share of inputs, the cost of capital and intermediate inputs can also be crucial factors for comparisons of cost competitiveness between countries.[3] Secondly, the measure reflects only *cost* competitiveness. In the case of durable consumer and investment goods, for example, competitiveness is also determined by other factors than costs, notably by technological and social capabilities and by demand factors. Improvements in product quality, customization or improved after-sales services are not necessarily reflected in lower ULC. Thirdly, measures of cost competitiveness may be distorted by the effects from, for example, bilateral market access agreements, direct and indirect export subsidies and tariff protection. However, we maintain that the relative importance of labor as a cost factor in competitiveness analysis, and the availability of statistical measures make the ULC still a good candidate for competitiveness studies.

3. International Comparisons of Productivity and Unit Labor Costs

Before being able to compare productivity, labor compensation and unit labor cost between China and India, it is useful to discuss the key limitation for this comparison. As indicated above, a fundamental issue concerns the adjustment for differences in relative price levels across countries (the third term on the right hand side in equation 4). Using the official exchange rate for converting output into a common currency, say, US dollars, assumes no price differences across countries. Exchange rates are clearly inappropriate for this purpose given the impact of capital mobility and currency speculation on these conversion rates. Current analytical work has been highly dependent on the Penn-World Tables (PWT) which relies on purchasing power parities (PPPs) derived from the UN International Comparisons Program (ICP). Some scholars applied economy-wide GDP PPPs at the industry level. This, however, introduces serious distortions especially for countries at lower levels of development for which GDP PPPs are heavily downwardly biased because of relatively cheap services due to the Balassa-Samuelson effect.

An alternative route followed in a range of studies under the International Comparisons of Output and Productivity (ICOP) project at the University of Groningen is to develop industry-specific purchasing power parities based on producer output data instead of final expenditure information (Maddison and van Ark, 2002). For the manufacturing sector, the basic data sources for the calculation of these industry specific PPPs are the industrial surveys or manufacturing censuses of the various countries. These contain product level data on quantities and output values, allowing for calculation of unit values for each item or group of items. For each matched product, the ratio of the unit values (UVR) in both countries is obtained. Subsequently these product UVRs are aggregated to an average UVR for manufacturing industries and for total manufacturing, using either gross output or value added as weights. Once these UVRs are obtained they can be applied to the

[3] One might argue that with greater international tradability of capital and intermediate inputs, labor input is the key determinant of cost competitiveness as it is much less mobile across countries.

output value for individual industries to obtain output and (in combination with labor input data) productivity comparisons for two or more countries.[4]

Although there have been various studies using the ICOP approach for China and India relative to the United States[5], there are few direct comparisons of productivity and unit labor cost levels between the two countries. The reason for this is the lack of sufficient product PPPs for such a direct comparison. The most recently published ICOP study on China/India by Lee et al. (2007) compares the two countries on the basis of 95 UVRs for 1985, whereas indirect comparisons between China/USA in 1995 by Szirmai et al. (2005) and India/Germany in 2002 by Erumban (2007) obtain 188 and 258 UVRs respectively.[6] We have therefore chosen to use the latter two studies, comparing China and India indirectly through a China/USA, India/Germany and Germany/USA comparison of manufacturing productivity levels.

For China, the basic source used by Szirmai et al. (2005) is the *Third Industrial Census* for 1995, which provides data on value added, employment and labor compensation for "national independent accounting industrial enterprises at and above township level". This source also provides measures on sales value and quantities on the basis of which UVRs could be computed.[7] For 2002, the estimates for China/USA were obtained by combining extrapolated productivity series by Szirmai et al. (2005) with new data for labor compensation per person employed for 2002 from Banister (2005).[8]

For India, the most recent study by Erumban (2007) compares India's registered manufacturing sector, using plant level data from the *Annual Survey of Industries* for 2002-2003. As Erumban chose to compare India to Germany, because of the greater availability of product information to create UVRs, an additional manipulation was needed to transform the India/Germany results to a comparison with the United States, for which 1997 ICOP data from Groningen University were used.[5]

Figures 1a to 1c summarize the results for China and India in comparison with four other emerging economies, of which two East European economies (Hungary and Poland), Mexico and South Korea, from 1990-2005. Unfortunately, there are only two data points (1995 and 2002) for China as reliable time series are still lacking, in particular for labor compensation (see also section 4).

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4 For an overview of studies using the ICOP methodology, see http://www.ggdc.net/dseries/icop.shtml.

5 For China/USA see, for example, Szirmai and Ren (2000), Szirmai et al. (2005) for 1985 and 1995 and Wu (2001) for 1997. For India/USA, see van Ark (1993) for 1973/74 and Timmer (2000) for 1983/84. For India/Germany, see Erumban (2007) for 2002.

6 A very recent as yet unpublished comparison between China and India for 1995 by Wu et al. (2007) has obtained 98 UVRs.

7 See Annex A for further detail. The manufacturing UVR obtained by Szirmai et al. (2005) was 4.6 Yuan/US$ as compared to an exchange rate of 8.35 Yuan/US$, suggesting a relative price level for manufacturing production in China at 55 per cent of the U.S. in 1995.

8 The compensation data related to a weighted average for urban manufacturing firms and large firms at township level, which is seen as roughly comparable to the "township level and above" data from Szirmai et al. (2005). See van Ark, Guillemineau and Banister (2006) for a more detailed discussion and presentation of the results.

Figure 1a: Relative Levels of Labor Compensation per Person Employed, 1990-2005

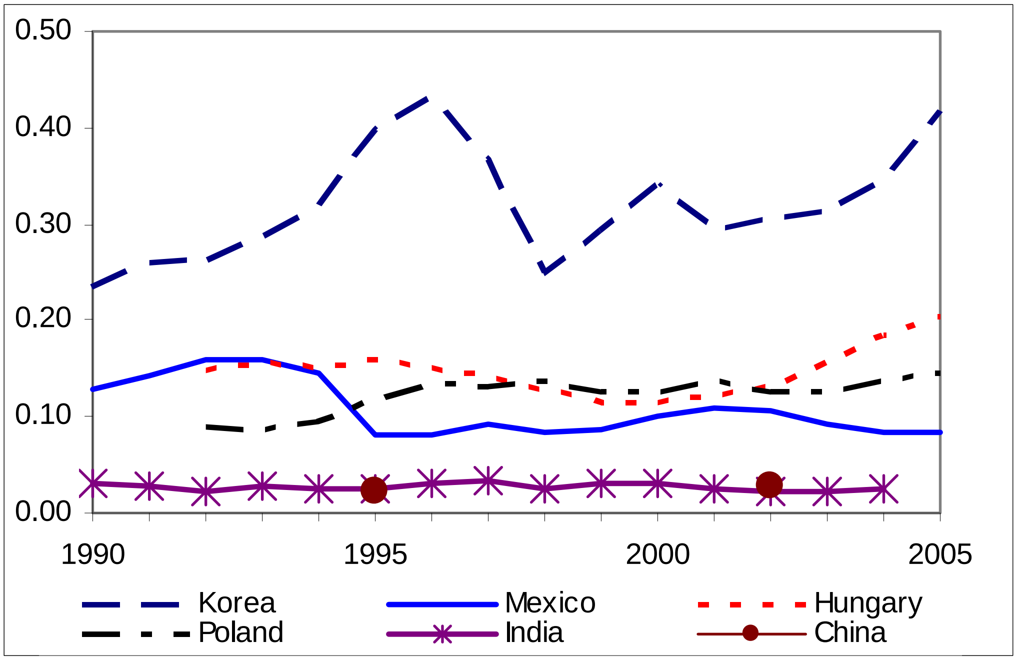


Figure 1b: Value Added per Person Employed, 1990-2005

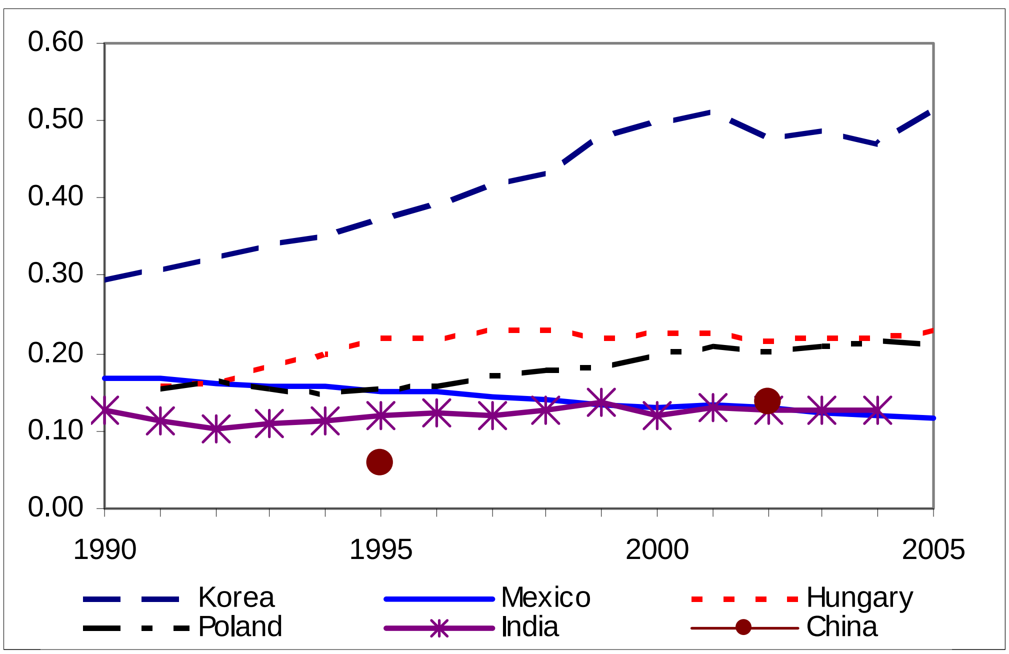
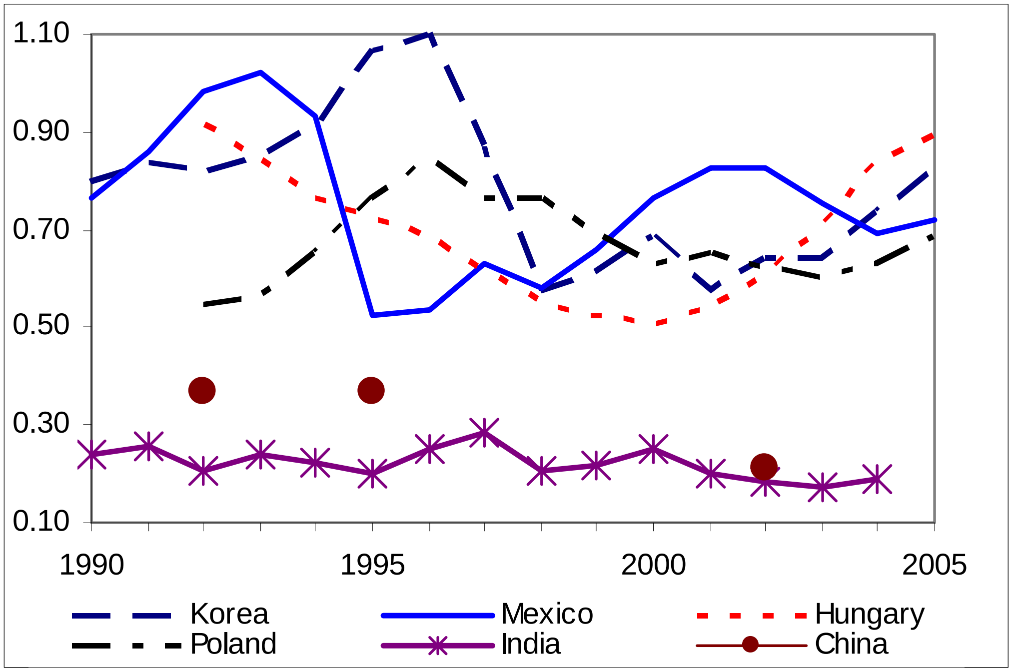


Figure 1c: Unit Labor Cost, 1990-2005



Note: labor productivity converted at industry-specific PPPs (see main text); labour compensation converted at exchange rate.
Sources: See Appendix Table 1A. India: Erumban (2007, updated); China: Szirmai and Ren (2005) and Banister (2005); other countries from ICOP data, available from ILO, Key Indicators of the Labor Market, 2007 (http://www.ilo.org/public/english/employment/strat/kilm/)

Figure 1a clearly shows that both China and India are characterized by the lowest levels of labor compensation in manufacturing at between only 2.5 to 3 per cent of the U.S. level in recent years. Since 1995 China has significantly caught up with labor compensation levels in India, which were typically higher than in China. By 2002 China had somewhat higher compensation levels, however.

Figure 1b shows that the productivity picture is much closer between various countries, except for Korea. In recent years Hungary and Poland show higher levels, but China, India and Mexico have similar labor productivity levels of between 13-14 per cent of the U.S. level. Again China showed a significant catch-up on the other countries and was somewhat ahead of both India and Mexico by 2002.

However, Figure 1c shows that small differences in the compensation gap relative to the productivity gap can have large implications for the comparative unit labor cost measure. Because of the relatively high levels of labor productivity compared to labor compensation levels both India and China have the lowest levels of unit labor cost of the six countries in this comparison. Even though China had somewhat superior productivity levels in manufacturing compared to India by 2002, due to its slightly higher compensation level, it was at a slight disadvantage in terms of unit labor cost relative to India.

Table 1: Labor productivity, Compensation and Unit Labor Cost, China and India, 2002, PPP converted (US=100.0)

Industry	China (US=100) Value Added/ Employee	India Value Added/ Employee	Compensation/ Employee	Unit Labour Cost
Food, Beverages and Tobacco	25.4	7.1	1.6	23.2
Textiles	25.5	11.0	3.0	27.1
Clothing	12.5	8.6	3.0	34.5
Leather and Footwear	30.9	13.8	2.0	14.2
Wood, Products of wood and cork	26.5	4.5	1.8	40.9
Pulp, paper and paper products	14.8	9.0	2.3	25.3
Coke, petroleum and nuclear fuel	3.6	13.6	3.9	29.0
Chemicals	5.8	15.0	2.4	16.3
Rubber and plastics	13.0	16.8	2.9	17.5
Non-metallic mineral products	24.5	12.7	1.9	15.0
Basic metals	15.9	25.6	4.1	16.1
Fabricated metal products	16.8	19.9	2.9	14.7
Machinery and equipment	40.2	15.3	3.6	23.7
Office machinery	5.9	10.3	3.5	34.4
Other elect. machinery		16.2	3.8	23.6
Radio, TV & comm.. equipment		31.4	3.4	10.7
Scientific and other instruments	10.3	11.4	2.9	25.4
Motor vehicles*	40.9	13.0	3.2	24.4
Furniture	43.7	21.1	3.4	15.9
Other manufacturing	9.5			
Total Manufacturing**	13.7	12.6	2.5	19.7

Source: India from Erumban (2007); China from Szirmai et al. (2005).
Notes: Labour productivity converted at industry-specific PPPs (see main text); labour compensation converted at exchange rate.
** For China: all transport equipment.*
*** India excludes printing and publishing and other transport manufacturing.*
India/USA is obtained through India/Germany from Erumban (2007) and Germany/USA from ICOP data, University of Groningen (http://www.ggdc.net). The totals are for the sum of the above industries.

It is also important to recognize that China's productivity advantage relative to India is only very recent. India clearly had higher productivity levels for most of the period (as well as in the period before), indicating high levels of capital intensity in India relative to China. When looking at the industry level, however, Table 1 shows that by 2002 China has a productivity level advantage over India in most industries, with the major exception of chemicals, basic metals and metal products, and – perhaps most surprisingly – the aggregate group of office machinery, electrical equipment, and radio, TV and communication equipment. These numbers therefore suggest a slight comparative advantage for these industries in India.

4. Regional Comparison of Productivity and Unit Labour Cost

While the international comparison of productivity, labor compensation and unit labor costs provides a useful perspective on global cost competitiveness, it seems desirable for large countries such as China and India to look at differences across provinces (in China) and states (in India). Not only does a regional breakdown inform location decisions of investors; it also provides evidence on whether provinces and states show a trend towards greater similarity (convergence) of unit labor cost, for example under the influence of integrated markets.

Basic Data

For China we exploit the information from two major censuses, the *Third Industrial Census* for 1995 and the *First Economic Census* for 2004 to obtain a comprehensive picture on the regional distribution of manufacturing output, labor compensation and employment, covering 30 provinces and 28 industries. Indeed these two censuses are the only source from which this output and compensation information can be obtained in a consistent way. The downside of using those sources, however, is that we cannot directly obtain a time series that we need to assess the consistency of the two censuses, because of a change in the firm classification in 1998. For 2004, our measure includes the group of 56.67 million employees in "enterprises of designated size and above", covering approximately 70% of total manufacturing employment in China. In Annex A we argue that these measures for 2004 are sufficiently compatible with the measures for "enterprises at township level and above" for 1995 to make an adequate comparison for those two years feasible.

The primary data for India comes from the *Annual Survey of Industries* (ASI), which is an annual survey of factories registered under Sections 2m(i) and 2m(ii) of the Factories Act (1948) and is the principal source of industrial statistics in India. Registered units are defined as factories employing 10 or more workers using power, and those employing 20 or more workers without using power. The entire unregistered manufacturing sector is not covered by the ASI, but over the past 25 years the share of unregistered manufacturing in total manufacturing output has shrunk to just over 30%. However, the share of unregistered manufacturing in total manufacturing employment is more than 80% of total manufacturing employment.

Still there are several reasons for focusing on the larger plants only. These include the difficulties in estimating output and labor compensation for smaller firms, in particular when going down to the regional and industry level. Moreover from a foreign entrepreneur's perspective who is deciding where to locate, for example China or India, it is the cost competitiveness of these larger firms that is most relevant to the decision making of the entrepreneur.

A related issue is the direct comparability between China's manufacturing firms of designated size and above and India's registered manufacturing factories. This is not a straightforward exercise as China's cut-off criterion in the firm distribution is the level of annual sales, whereas in India it is the number of employees. Moreover, India's distribution is based on factories, whereas China uses firms which may include multiple factories. Still using the size distribution for India's registered manufacturing sector as reported in the EPWRF-ASI database (2007)[9], we calculated China's distribution using Chinese firm level data based on China's industrial enterprise statistics for 2004.[10] As can be seen from Table 2, the share of employment in higher employment intervals (100-199 and above) is far bigger in case of China's manufacturing *firms* of designated size and above as compared with India's registered *factories*. In China among manufacturing firms of designated size and above, only 25% of the firms and 3.3% of total employment belong to the firms with less than 50 employees, while in India the respective shares in this low interval are 76.8% of *factories* and 20.5% of employment in those factories.

Table 2: Size Distribution, China and India: A Comparison

Interval	China		India	
	Designated size and above		Registered manufacturing	
	% firms	% employment	% factories	% employment
0-49	25.0	3.3	76.8	20.5
50-99	26.2	8.2	10.7	11.7
100-199	23.0	14.2	6.1	12.8
200-499	17.3	23.3	4.0	17.2
500-999	5.3	15.9	1.5	12.2
1000-1999	2.0	12.2	0.6	8.4
2000-4999	0.9	12.1	0.3	8.3
5000 and above	0.2	10.8	0.1	9.0

Sources: India: EPWRF-ASI database (2007); China: industrial enterprise statistics for 2004.
Notes: units in China are firms; units in India are factories.

According to Table 2, more than 97% of manufacturing firms of designated size and above in China qualify for the definition of the registered manufacturing factories in

[9] According to the definition of registered manufacturing factories in India, it is preferable to use the cut-off employment size at 10 and 20. However, as we do not have firm level data from India to calculate the distribution at our desirable employment cut-offs, we have to use the listed cut-offs in India's aggregate table as reported in EPWRF database.

[10] China's industrial enterprise statistics are collected and maintained by NBS. The database is at the individual firm level for 39 industries covering the mining, manufacturing and utility sectors. In 2004, these firms include all state-owned industrial enterprises and non-state industrial enterprises with annual sales over five million Yuan (firms of designated size and above).

India. One can even be confident that there are Chinese manufacturing firms below designated size with more than 10 or 20 employees in manufacturing, which should be included in order to make a fully comparable analysis between India and China feasible. Although the unit of observation is the *factory* in India while in China it is the *firm*, which may consist of several factories, it is unlikely that this biases the results much. The large firm scale in China is a result of the favorable policies toward large firms in China, whereas in India, pre-reform policies (such as small scale industries, labor regulation applying to the registered sector and licensing) have tended to encourage small factories.

Some Descriptive Results for Chinese Provinces and Indian States

Figures 2 and 3 show our main results along each of the two dimensions (province/state and industry) in our study. Figure 2 provides a comparison of the changes in ALC, ALP, and ULC for total manufacturing across provinces in China (Figure 2a) and states in India (Figure 2b). In figures 3a and 3b we provide a comparison on the same variables by manufacturing industry for each country. The three indicators (ALC, ALP, and ULC) for China are measured for 2004 relative to 1995, and for India in 2002 relative to 1993.

The two figures bring out the stark differences between China and India. Figures 2a and 3a show a rapid decline in unit labor cost in China across the board, both by province as well as by industry. For the nation as a whole, ULC declined by about 40% between 1995 and 2004 whereas ALC and ALP increased by 3 and 5 times respectively. In contrast, barring a few exceptions, unit labor cost in India increased, both by state as well as by industry (Figures 2b and 3b). ULC increased by approximately 50% reflecting an increase in ALP of 1.5 times which has been more than offset by an increase in ALC of 2.25 times over the period 1993-2002.[11]

Looking at changes across provinces within China (Figure 2a), some provinces show substantially larger declines in ULC than the national average, but – with the exception of Shanghai – these are all relatively underdeveloped provinces outside the coastal area. While labor compensation grew at a relatively similar rate among provinces of between 2 and 4 times from 1995 and 2004, labor productivity growth differentials were much bigger (between 4 and 10 times). With a few exceptions, the Chinese provinces with the fastest decline in unit labor cost are also typically the ones with the most rapid growth in productivity (between 6 and 8 times). The variation across provinces in the relative ALC, ALP, ULC, as measured by coefficient of variation (CV), are 0.21, 0.30 and 0.25 respectively. Hence on the whole, productivity accounted for more of the variation in unit labor cost between provinces than labor compensation.

Looking at India, Figure 2b shows that ULC declined for only six states (Meghalaya, Pondicherry, Manipur, Nagaland, Tripura, Himachal Pradesh, Andaman & N. Island) and dramatically increased for the two states on the right hand side of the chart (Chandigarh and Jammu & Kashmir). However, it is to be noted that each of these

[11] The increase in unit labor cost in India contrast with the flat trend in the international comparison in Section 3. However, the present comparison is in national currencies rather than in U.S.$, so that a possible decline in relative price levels in India is not reflected in the national data (see also the concluding section).

outlier states account for less than 1% of gross value added and employment in nation-wide gross value added and employment in both benchmark years. If we focus on the *main* states, we find that while ALC changed 2.75 to 3.75 times, which was roughly similar to China, growth in ALP (1-2 times) is far less than the 4-10 times increase in China. As a result all the main states in India show an increase in ULC of about 10%-100% as opposed to a decline in ULC across all the provinces in China. The coefficient of variation in the three indicators (ALC at 0.12, ALP at 0.18, ULC at 0.16) across the main states in India is smaller compared to the respective variation across provinces in China.

Figure 3a shows somewhat more variation in ALC (0.29), ALP (0.31) and ULC (0.42) across industries in China than across provinces, in particular for ULC. On the whole, productivity growth and ULC declines are fastest in several capital intensive industries, including electric equipment and transportation equipment. In contrast, labor intensive industries, such as sport products, leather and garments, showed the slowest increases in productivity and the least declines in ULC.

Figure 3b shows the results for each of the 28 industries in India. Only two industries (electronics and instruments) show an increase in ALP which offsets an increase in ALC resulting in a decrease in ULC. This is different from China where 26 of the 28 industries saw an increase in ALP beyond ALC causing ULC to decline (Figure 3a). At the other end, industries such as cultural, educational & sports goods, garments, leather products, and rubber products show the lowest increase in ALP. With little variation in increases in ALC across industries, the first three industries show an increase in ULC which are among the highest. As in China, there is greater variation in the changes in ALC, ALP, and ULC across industries in India than in China. A greater variation in productivity (CV of 0.4), as opposed to labor compensation (CV of 0.18), seems to be accounting for a greater variation in ULC (CV of 0.38) across industries.

Figure 2a: Change in ALC, ALP & ULC by Province for Total Manufacturing – All – China (1995=100)

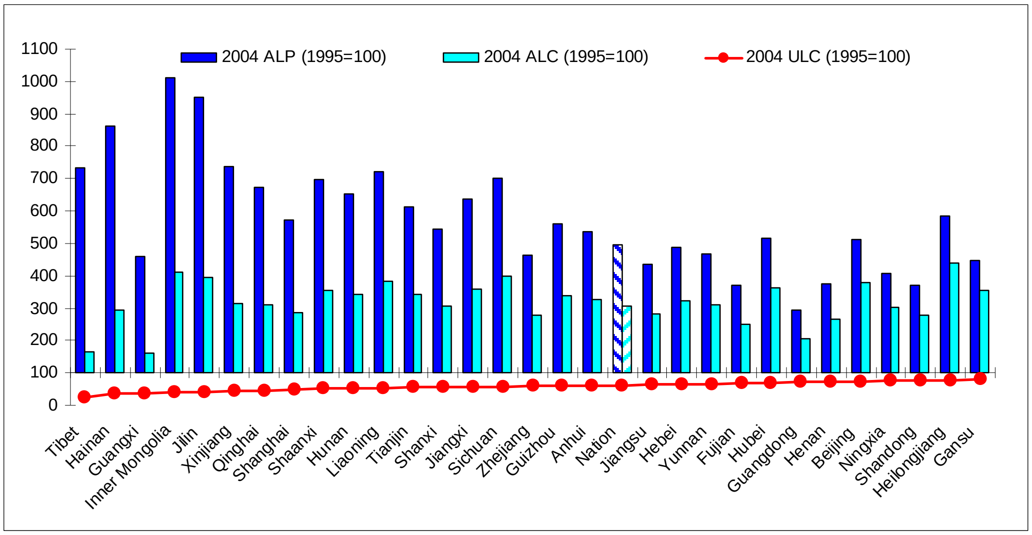


Figure 2b: Change in ALC, ALP & ULC by State for Total Manufacturing – All – India (1995=100)

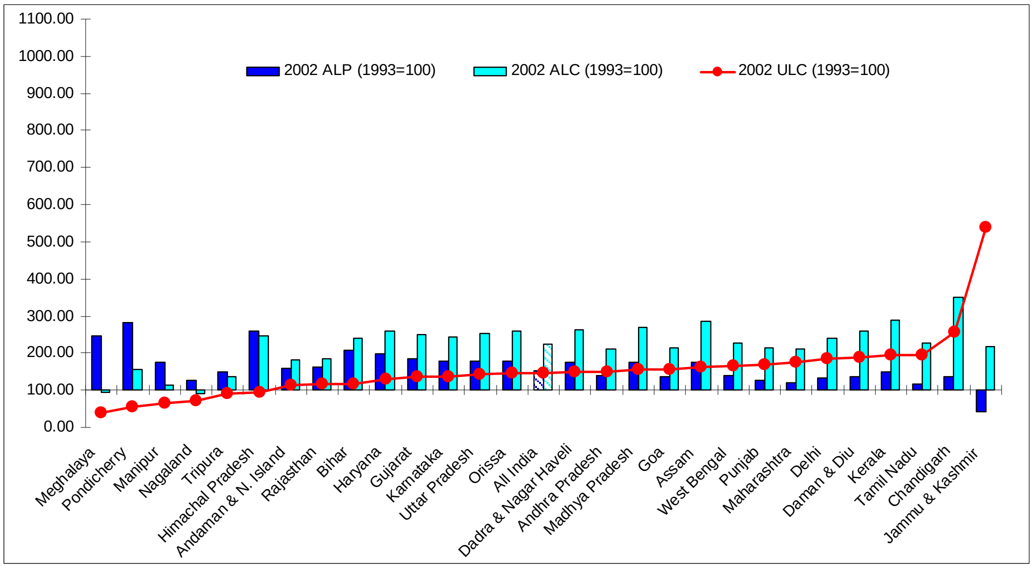


Figure 3a: Change in ALC, ALP & ULC by Industry for All – China (1995=100)

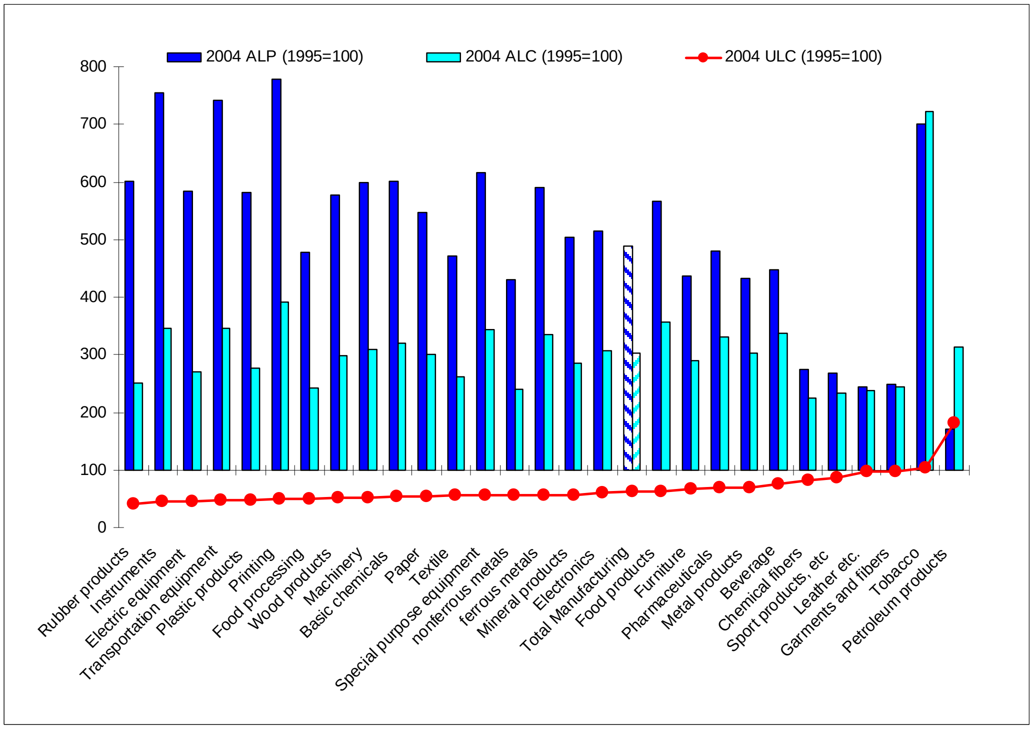
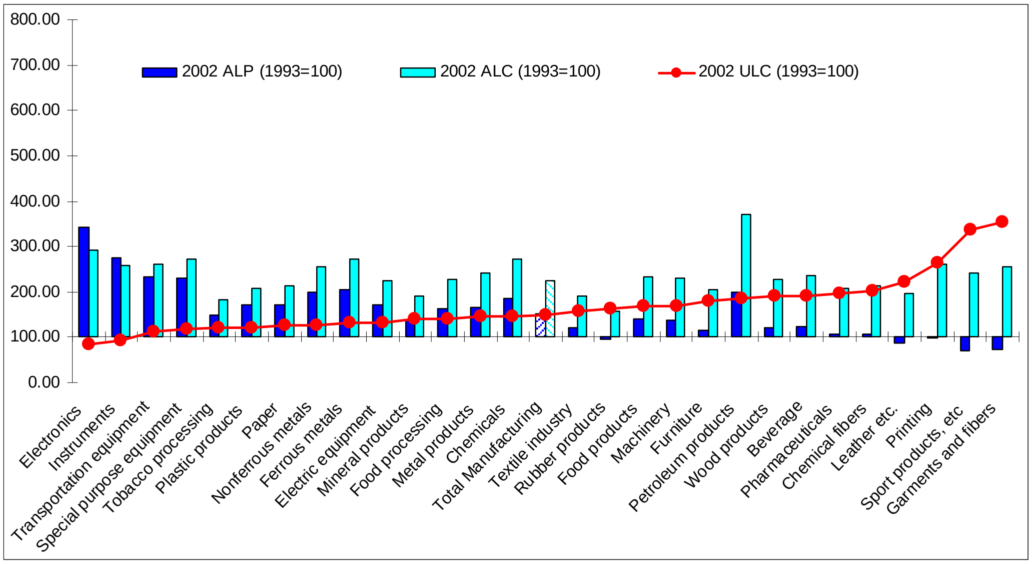


Figure 3b: Change in ALC, ALP & ULC by Industry for All – India (1995=100)



A significant contribution of the present analysis is the construction of a full industry by province/state panel for each of the three indicators (ALC, ALP and ULC) for both China and India. While presentation and discussion of the entire industry by province/state panel for each of the three indicators is not feasible here, we discuss the results in terms of a summarized 5/6-region by 8-industry group panel.[12]

Table 3a shows a matrix of the change in ALC, ALP and ULC by industry group and each of the six regions in China between 1995 and 2004. It shows that the labor compensation increases were the highest in the electronics industry group in the Southwest and Northeast regions. Labor productivity increased fastest in all industry groups in the Northeast region. In contrast productivity growth was slower in the richer provinces in Bohai and the Southeast. ULC declined most rapidly in the Northeast, Southwest and Northwest regions, and less in the booming regions such as Bohai, the Southeast and the Central region.[13] Although the picture is not entirely consistent, there is good reason to argue that the trends in ALP, ALC and ULC in China are at least in part related to traditional convergence trends. Regions that are characterized by low productivity levels tended to grow faster in terms of productivity and showed bigger unit labor cost declines than high productivity level regions during this period. This is also clear from Table 4a which shows relatively low levels of compensation and productivity in the Northeast, Central and Northwest regions for the first year in our analysis (1995), whereas the Bohai and Southeast region showed relatively higher levels.

[12] The grouping of 28 industries into 8 industry groups and of provinces (states) into regions is provided in Appendix Tables 2 and 3 respectively.

[13] In this table (as well as in Table 4A) we do not separately present the Tibet region, which is very small in terms of its share in total manufacturing (less than 1% of overall manufacturing value added) in China.

Table 3a: Change of ALC, ALP & ULC by industry Groups and Seven Regions

	Bohai	SouthEast	NorthEast	Central	SouthWest	NorthWest	All Nation
Panel A: ALC Index (04/95)							
Food Products	285.4	317.8	459.3	343.7	353.5	370.7	334.3
Textile & Clothing	238.2	219.7	331.5	241.7	234.6	250.1	255.4
Wood & paper	283.0	232.6	342.6	309.0	263.7	392.2	298.7
Chemicals	274.5	263.5	384.1	296.4	284.3	317.4	297.7
Metal products	361.0	254.1	393.6	335.1	269.9	325.5	313.2
Machinery	297.8	240.4	364.4	299.8	375.1	341.1	304.7
Transport equipment	314.2	297.1	386.5	390.8	308.4	385.9	346.3
Electronics	371.7	257.1	478.9	379.4	434.0	276.2	322.0
Total Manufacturing	302.5	249.8	397.9	320.0	315.6	337.3	304.9
Panel B: ALP Index (04/95)							
	Bohai	**SouthEast**	**NorthEast**	**Central**	**SouthWest**	**NorthWest**	**All Nation**
Food Products	412.1	626.2	799.2	509.1	488.5	727.0	531.4
Textile & Clothing	375.7	279.6	678.5	315.8	642.2	410.5	364.4
Wood & paper	486.3	348.1	658.3	557.7	595.2	739.6	499.1
Chemicals	361.7	406.7	584.0	364.9	598.8	440.5	445.0
Metal products	507.0	428.5	835.7	593.2	536.7	605.6	548.9
Machinery	598.8	462.2	818.3	524.9	796.4	755.6	624.1
Transport equipment	617.6	598.4	866.2	747.6	760.9	910.7	742.6
Electronics	662.9	470.2	749.7	1032.1	-97.9	513.4	592.9
Total Manufacturing	439.3	394.9	747.3	504.6	599.4	634.2	494.5
Panel C: ULC Index (04/95)							
	Bohai	**SouthEast**	**NorthEast**	**Central**	**SouthWest**	**NorthWest**	**All Nation**
Food Products	69.3	50.7	57.5	67.5	72.4	51.0	62.9
Textile & Clothing	63.4	78.6	48.9	76.5	36.5	60.9	70.1
Wood & paper	58.2	66.8	52.0	55.4	44.3	53.0	59.9
Chemicals	75.9	64.8	65.8	81.2	47.5	72.0	66.9
Metal products	71.2	59.3	47.1	56.5	50.3	53.8	57.1
Machinery	49.7	52.0	44.5	57.1	47.1	45.1	48.8
Transport equipment	50.9	49.6	44.6	52.3	40.5	42.4	46.6
Electronics	56.1	54.7	63.9	36.8	-443.3	53.8	54.3
Total Manufacturing	68.9	63.3	53.2	63.4	52.6	53.2	61.7

Note: Tibet – representing less than 1% of total value added in China – is not separately shown, but included in the total

Table 3b provides the corresponding 5 region by 8 industry panel of changes in India between 1993 and 2002.[14] It shows that the increase in ALC exceeded the increase in ALP, with the exception of electronics in West and Central regions. Hence ULC increased between 1993 and 2002 across all regions, industry groups and their combinations. This is starkly different from China where the increase in ALP outpaced the increase in ALC causing ULC to decline. Furthermore, the increases in ALP in case of India were smaller as compared to those in China. Another point that stands out is the similar increase in ALC across regions and industry groups (Panel A), whereas the increase in ALP varies much more (Panel B). Thus, the variation in the changes in ULC across Panel C is largely due to variation in ALP.

Table 3b: Change in ALC, ALP & ULC by Industry Group and Region-India

	Panel A: ALC Index (02/93)					
	North	**East**	**Central**	**West**	**South**	**All-India**
Food Products	222.3	195.1	271.6	191.7	230.7	225.4
Textiles & Clothing	221.5	222.6	178.3	192.4	193.2	194.5
Wood & Paper	230.2	240.7	240.6	206.4	235.5	231.4
Chemicals	229.2	271.0	228.1	213.6	245.8	230.7
Metal Products	219.5	246.5	305.0	231.9	208.4	225.8
Machinery	275.7	224.5	272.2	224.4	260.4	245.4
Transport Equipment	261.7	286.5	269.7	225.9	287.2	261.3
Electronics	285.2	292.7	292.7	262.4	278.0	278.7
Total Manufacturing	238.6	233.5	258.6	214.4	229.1	225.4
	Panel B: ALP Index (02/93)					
	North	**East**	**Central**	**West**	**South**	**All-India**
Food Products	122.4	111.4	137.4	149.4	160.9	142.7
Textiles & Clothing	109.9	141.4	138.3	118.1	92.3	109.9
Wood & Paper	154.2	66.6	170.4	124.8	113.4	122.5
Chemicals	164.8	192.8	146.5	138.3	138.4	148.7
Metal Products	183.6	204.9	209.0	167.4	130.5	167.1
Machinery	180.9	174.7	215.2	151.1	204.5	179.1
Transport Equipment	231.9	216.6	230.0	164.7	260.1	233.5
Electronics	272.9	211.2	446.1	412.0	227.4	316.9
Total Manufacturing	156.8	166.2	176.1	143.8	139.6	152.8
	Panel C: ULC Index (02/93)					
	North	**East**	**Central**	**West**	**South**	**All-India**
Food Products	181.5	175.2	197.7	128.3	143.3	157.9
Textiles & Clothing	201.7	157.4	129.0	162.8	209.3	176.9
Wood & Paper	149.3	361.2	141.2	165.4	207.7	189.0
Chemicals	139.1	140.5	155.7	154.4	177.7	155.1
Metal Products	119.5	120.3	145.9	138.5	159.7	135.2
Machinery	152.4	128.5	126.5	148.4	127.3	137.0
Transport Equipment	112.9	132.3	117.3	137.1	110.4	111.9
Electronics	104.5	138.6	65.6	63.7	122.2	87.9
Total Manufacturing	152.2	140.4	146.9	149.1	164.2	147.5

Note: the Northeast – where 4 of the 5 states (except Assam) represent less than 1% of total value added in India – is not separately shown, but included in the total

[14] In this presentation of the India results we do not present or discuss the numbers relating to the North East region, where 4 of the 5 states (except Assam) account for less than 1% in All-India total manufacturing GVA and employment.

We also see from Panel B in Table 3b that the productivity increase in the electronics and transport equipment industry groups are among the highest for each of the regions. Except for Central and West, these increases are more than offset by increase in ALC leading to an increase in ULC. These two industry groups also show the largest increase in productivity at the All-India level and the lowest increase in ULC. With the exception of Central and East Regions, textiles & clothing showed the lowest increase in ALP and a pattern that carries over to the All-India level as well.

Table 4a: Relative level of ALC, ALP & ULC by Industry Groups and Seven Regions in 1995, All China=100

Panel A: ALC	Bohai	South East	North East	Central	South West	North West	All Nation
Food Products	98	135	71	82	113	79	100
Textile & Clothing	90	130	61	75	81	80	100
Wood & paper	103	139	65	77	108	67	100
Chemicals	104	128	84	76	94	88	100
Metal products	88	127	92	87	104	95	100
Machinery	96	136	79	79	84	84	100
Transport equipment	101	133	91	83	100	78	100
Electronics	113	123	59	69	65	92	100
Total Manufacturing	96	129	81	80	96	87	100

Panel B: ALP	Bohai	South East	North East	Central	South West	North West	All Nation
Food Products	93	106	45	99	178	54	100
Textile & Clothing	99	141	33	77	38	62	100
Wood & paper	123	143	53	84	83	58	100
Chemicals	127	132	85	75	66	69	100
Metal products	110	138	76	86	80	88	100
Machinery	110	152	60	81	66	56	100
Transport equipment	110	167	89	72	75	45	100
Electronics	153	124	50	47	54	74	100
Total Manufacturing	112	132	67	82	91	69	100

Panel C: ULC	Bohai	South East	North East	Central	South West	North West	All Nation
Food Products	105	127	158	83	63	145	100
Textile & Clothing	91	92	182	97	210	129	100
Wood & paper	84	98	122	92	130	116	100
Chemicals	82	97	98	102	144	127	100
Metal products	80	92	121	101	130	108	100
Machinery	88	89	131	97	128	149	100
Transport equipment	92	79	102	114	134	173	100
Electronics	74	99	117	149	120	124	100
Total Manufacturing	85	98	120	98	106	125	100

Note: Tibet – representing less than 1% of total value added in China – is not separately shown, but included in the total

From Panels B and C we see that the highest productivity increases and the lowest ULC increases are in the Central and East regions in India. To the extent that these regions have historically been lagging in terms of per capita income, there is some indication of "catching-up" in the sense of traditional convergence trends. Indeed Table 4b shows that the North, East, North East, and Central (albeit marginally) have lower ALP than All-India ALP in 1993. These regions also witness increases in ALP greater than All-India increase in ALP.

Table 4b: Relative levels of ALC, ALP & ULC by Industry Group and Region in 1993, All-India=100

			Panel A: ALC			
	North	**East**	**Central**	**West**	**South**	**All-India**
Food Products	121	105	115	154	74	100
Textiles & Clothing	94	115	108	116	80	100
Wood & Paper	104	89	88	122	91	100
Chemicals	81	103	80	129	69	100
Metal Products	65	139	93	92	82	100
Machinery	75	95	99	114	95	100
Transport Equipment	78	94	84	135	99	100
Electronics	83	96	99	94	114	100
Total Manufacturing	87	122	95	126	77	100
			Panel B: ALP			
	North	**East**	**Central**	**West**	**South**	**All-India**
Food Products	165	114	137	125	65	100
Textiles & Clothing	136	49	106	111	98	100
Wood & Paper	87	143	65	111	93	100
Chemicals	67	51	90	149	61	100
Metal Products	74	111	102	108	89	100
Machinery	76	76	105	124	87	100
Transport Equipment	107	53	80	158	96	100
Electronics	100	57	95	95	114	100
Total Manufacturing	95	85	99	142	75	100
			Panel C: ULC			
	North	**East**	**Central**	**West**	**South**	**All-India**
Food Products	73	92	84	123	115	100
Textiles & Clothing	69	232	102	104	82	100
Wood & Paper	119	62	135	109	97	100
Chemicals	120	202	89	87	113	100
Metal Products	89	125	90	86	91	100
Machinery	98	124	95	92	109	100
Transport Equipment	73	178	105	86	103	100
Electronics	82	168	104	99	100	100
Total Manufacturing	92	143	95	89	103	100

Note: the Northeast – where 4 of the 5 states (except Assam) represent less than 1% of total value added in India – is not separately shown, but included in the total

However, the traditional convergence picture is somewhat distorted by the performance of the South region. First, even though the ALP is 25% below the national average and lower than all other regions, it does not show any sign of catching up (ALP increase is the slowest). Second, the South has historically performed above average in terms of per capita income and hence South's below average ALP is somewhat puzzling and requires further investigation.

5. Convergence trends in compensation, productivity and unit labor cost

Catch Up (Beta) Convergence

Following the descriptive analysis in the previous section, we verify the convergence trends using conditional and unconditional *beta* convergence analysis, where we relate the growth in the three indicators with their initial levels. We estimate a beta-convergence specification commonly used in the economic growth literature in a cross-country analysis. The general specification takes the following form:

$$Y_{ij} = \alpha_0 + \alpha_1 Z_{ij} + \phi_i + \theta_j + \varepsilon_{ij} \qquad (5)$$

where, Y_{ij} is the growth rate (difference of logs) in industry *i* and province (state) *j* for one of the three indicators: ALC, ALP and ULC, Z_{ij} is the log of the initial value of the corresponding indicator, ϕ_i and θ_j are industry and province (state) dummy variables respectively, capturing the industry and province (state) fixed effects. A significant negative coefficient for the initial value of the indicator, i.e., α_1, indicates a convergence trend.

This convergence regression is also tested across states at the aggregate manufacturing level. For example, taking state level ULC for total manufacturing, the specific regression takes the form of:

$$LnULC_j^t - LnULC_j^{t-1} = \alpha_0 + \alpha_1 LnULC_j^{t-1} + \varepsilon_j \qquad (6)$$

Using the industry by province/state panel, we estimate both the unconditional (as above) and a conditional convergence regression:

$$LnULC_{ij}^t - LnULC_{ij}^{t-1} = \alpha_0 + \alpha_1 LnULC_{ij}^{t-1} + \phi_i + \theta_j + \varepsilon_{ij} \qquad (7)$$

The results of this analysis are presented in Tables 5a and 5b for China and India respectively. We perform the analysis at two different levels: across provinces or states for total manufacturing (Panel A) and for the entire industry by province/state panel (Panel B). For Panel A in each table, we are restricted to examining only the unconditional convergence, whereas in Panel B we examine both unconditional convergence and conditional convergence (taking into account province and industry dummies).

Table 5a: Beta Convergence, OLS Regression Results: China

	Dependent Variable is the growth of								
	Panel A: By Province			Panel B: 28 Industries by 30 Provinces					
	ALC	ALP	ULC	ALC	ALP	ULC	ALC	ALP	ULC
Log Initial ALC	-0.618***			-0.370***			-0.848***		
	(0.147)			(0.048)			(0.055)		
Log Initial ALP		-0.427***			-0.339***			-0.808***	
		(0.142)			(0.045)			(0.071)	
Log Initial ULC			-0.696***			-0.593***			-0.819***
			(0.211)			(0.043)			(0.054)
Constant	6.488***	5.845***	-1.282***	4.311***	4.908***	-1.099***	8.649***	9.752***	-1.508***
	(1.258)	(1.364)	(0.211)	(0.408)	(0.430)	(0.042)	(0.475)	(0.636)	(0.094)
Industry/Province Dummies	No	No	No	No	No	No	Yes	Yes	Yes
Observations	30	30	30	805	796	794	805	796	794
R-squared	0.57	0.27	0.44	0.17	0.17	0.38	0.70	0.64	0.67

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 5b: Beta Convergence, OLS Regression Results: India

Dependent Variable is the growth of

Panel A: By State

	ALC	ALP	ULC	ALC	ALP	ULC
	All States			Main States		
Log Initial ALC	0.224			-0.104		
	(0.17)			(0.09)		
Log Initial ALP		-2.11			21.80	
		(9.5)			(29.5)	
Log Initial ULC			-97.597**			-20.34
			(42.1)			(24.6)
Constant	-1.58	77.87	402.97**	1.96*	-91.63	127.04
	(1.8)	(62.3)	(162.9)	(1.0)	(200.9)	(86.6)
Industry/State FE	No	No	No	No	No	No
Observations	28	28	28	16	16	16
R-squared	0.06	0.00	0.29	0.07	0.05	0.03

Panel B: 28 Industries by states

Dependent Variable is the growth of

	ALC	ALP	ULC	ALC	ALP	ULC	ALC	ALP	ULC	ALC	ALP	ULC
	All States						Main States					
Log Initial ALC	-0.073**			-0.361***			-0.041			-0.304***		
	(0.035)			(0.055)			(0.038)			(0.061)		
Log Initial ALP		-0.37***			-0.679***			-0.268***			-0.489***	
		(0.053)			(0.061)			(0.046)			(0.061)	
Log Initial ULC			-0.65***			-0.799***			-0.532***			-0.609***
			(0.058)			(0.055)			(0.052)			(0.054)
Constant	1.6***	3.0***	2.71***	4.42***	5.08***	2.90***	1.29***	2.27***	2.34***	3.8***	3.67***	2.34***
	(0.36)	(0.36)	(0.20)	(0.55)	(0.46)	(0.22)	(0.40)	(0.31)	(0.19)	(0.60)	(0.44)	(0.20)
Industry/State FE	No	No	No	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes
Observations	543	543	543	543	543	543	412	412	412	412	412	412
R-squared	0.01	0.14	0.31	0.33	0.45	0.54	0.00	0.10	0.27	0.31	0.39	0.48

Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%

As we see from Table 5a, the coefficient on the initial level of ALP, ALC, ULC (in their respective columns) is always negative and statistically significant for China, signaling convergence across provinces, and province-industry pairs.[15] This result is also consistent with the above pattern seen in Tables 3a and 4a where regions in China with initial lower levels of ALC, ALP and higher levels of ULC witnessed the biggest changes.

In the case of India, however, the results show a mixed pattern. Results in Panel A in Table 5b show no convergence as the coefficients on the initial terms for ALP and ALC are insignificant. Even though the sign on ULC is negative and significant, the high magnitudes are indicative that they are driven by outliers. Indeed if we restrict our sample to main states and do a similar exercise we find the initial ULC is no longer significant. However, in Panel B (unconditional or conditional convergence, all states or main states) we find strong evidence of convergence across state industry pairs. This contrasts with the lack of any signs of convergence at the aggregate state level. One possible explanation for this could be that while there may be between-state convergence observed at the detailed industry level, large differences in industrial composition across states drive the lack of convergence at the aggregate level. This is an area for further research.

Cross Province/State (Sigma) Convergence

To obtain a better understanding of the degree of convergence across space, we look at the distribution of the comparative levels of ALP, ALC and ULC for the two benchmark years across provinces/states in the two countries. This implies we examine *sigma* convergence. In this section we use a simple metric, the coefficient of variation (CV) to understand degree of convergence that has taken place across spatial units (regions and states) for each of the three indicators, ALC, ALP, and ULC. CV, expressed as a ratio of standard deviation to mean, is a standard measure of inequality that helps us gauge the distribution of the variable of interest. Figure 4 shows the CV across provinces/states in China and India for each of the three indicators.

Figures 4a-4f summarize the results for sigma convergence. Figures 4a, 4c, 4e show that the CVs across seven regions in China[16] for all three variables (ALP, ALC and ULC) at aggregate manufacturing level ("TOT") exhibit a dramatic decline to well below 0.1. Even though the CVs across provinces (instead of regions) are considerably higher, picking up more variation due to *intra*-regional specialization, the decline in inequality between 1995 and 2004 is still impressive. In particular, the huge decline in the CV for ULC to 0.18 (from 0.30 in 1995) on the basis of the provincial grouping, and even to 0.05 when using the seven region grouping, shows that aggregate unit labor cost levels are now very close between regions. This suggests that provinces (or regions) with high productivity levels relative to the all nation average also have relatively high compensation levels.

[15] Following the common practice in India, we also restrict 30 provinces to those with GVA share more than 1% in the convergence regression analysis for China. The results for those major provinces remain unchanged.

[16] For this analysis we have included Tibet as the seventh region in our sample.

Figure 4a: Coefficient of Variation for ALC by Industry, China

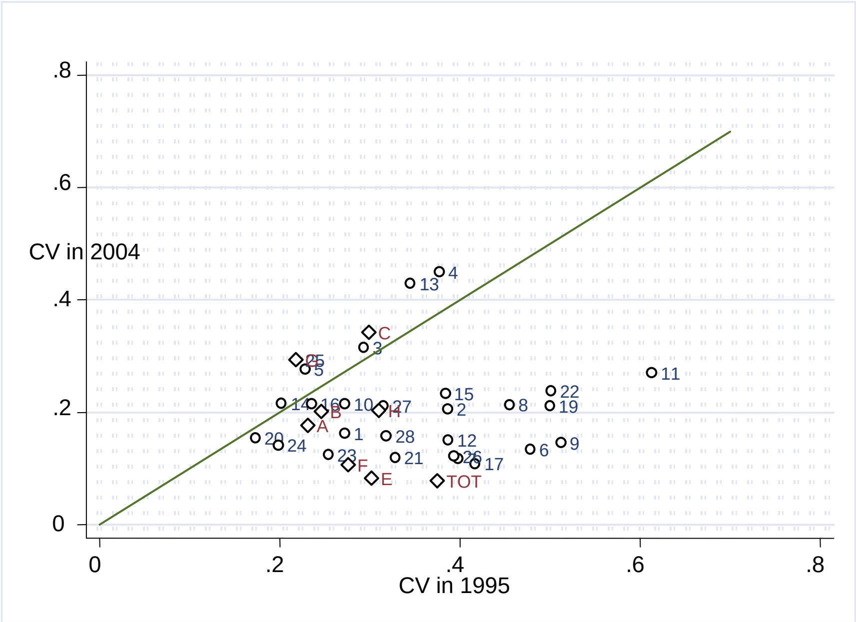


Figure 4b: Coefficient of Variation for ALC by Industry, India

Figure 4c: Coefficient of Variation for ALP by Industry, China

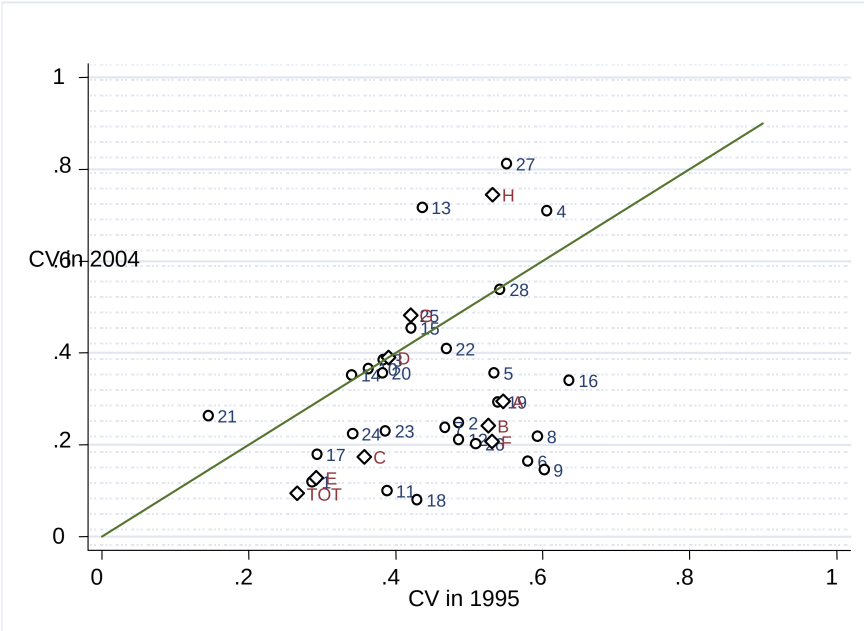


Figure 4d: Coefficient of Variation for ALP by Industry, India

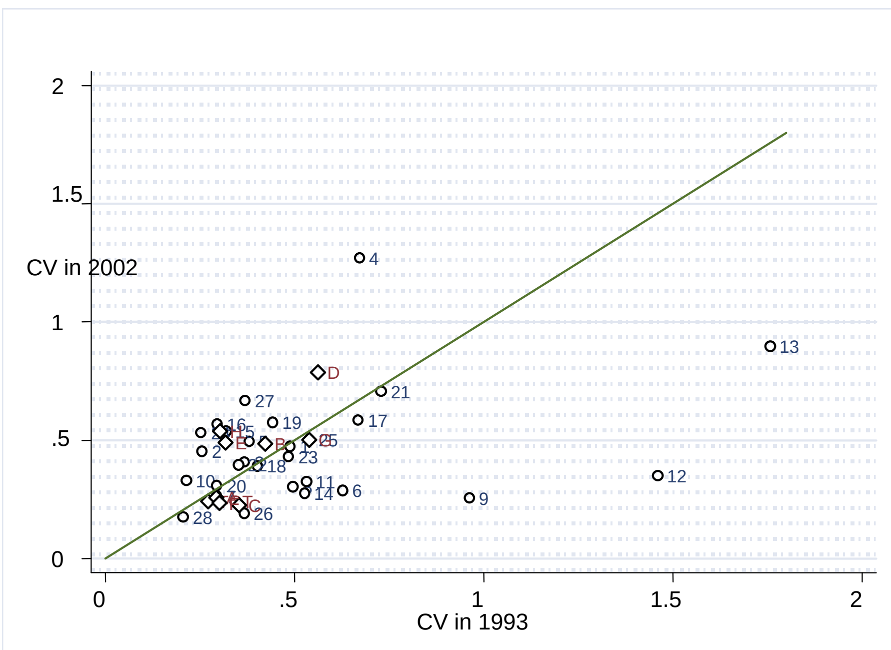


Figure 4e: Coefficient of Variation for ULC by Industry, China

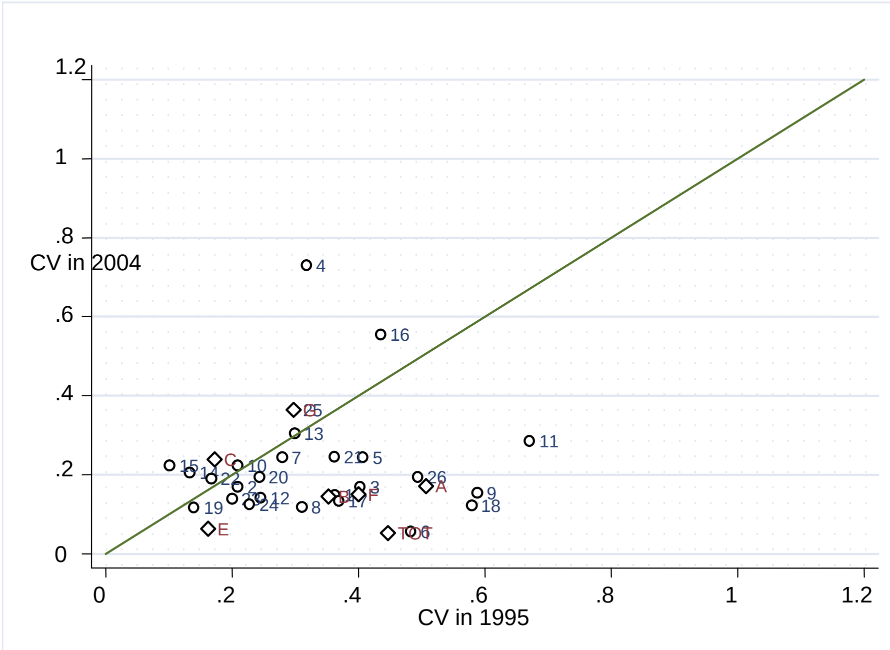
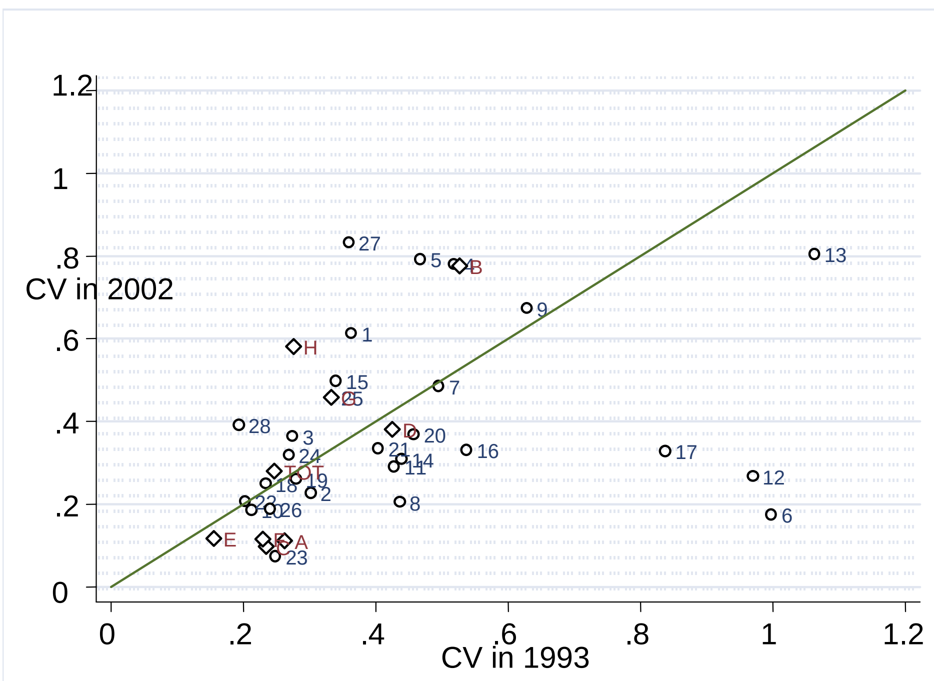


Figure 4f: Coefficient of Variation for ULC by Industry, India



This aligning of the ALC and ALP levels across provinces (regions) can essentially be ascribed to the transformation from planning towards a market system. As a result inefficient activities which were carried out at the “wrong” place due to resource misallocations (given the large differences in gaps for comparative productivity and labor cost levels relative to the national average) have been mostly eradicated during this period.

For India, however, even though we see a decline in CV for total manufacturing in ALC and ALP and increase in case of ULC across regions, this pattern is not consistent across different spatial groupings even for the total manufacturing. Furthermore, the decline in CV across regions for total manufacturing is not as large as the declines in case of China. As we see from Figure 4b and 4d, total manufacturing (“TOT”) is very close to the 45 degree line indicating only a marginal decline in CVs. This suggests that the kind of market forces that have led to the alignment of ULC across provinces in China are not at play (yet) in the case of India and points to the immobility of resources across space and industries.

When examining the sigma convergence for individual industries and industry groups, we find that the strong decline in the CV for ALC in aggregate manufacturing, in case of China, is reflected in the decline in regional inequality for six of the eight major industry groups (with the exception of the wood & paper and transport equipment groups). For labor productivity, the CV for the chemicals group remained constant, but it increased for the last two industry groups, transport equipment and electronics. Indeed transport equipment also exhibited an increase in CV for unit labor cost. In our companion paper for China (Chen et al, 2007), we have linked this observation to the analysis of characteristics of industries that show divergence rather than convergence trends. This points at the possibility that relatively capital and skill intensive industries are more likely to show strong spatial concentration effects, so that those are not contributing much to the overall convergence trend.

In India, the results for *sigma* convergence are just the opposite to China. In the case of ALC, only three (food products, wood paper and transport equipment) out of eight industry groups show a decline in CV. In addition to these three groups, transport equipment also shows a decline in CV in ALP. For ULC, most industry groups show a decline in CV. However, the extent of these declines are not as big as in case of China, as the observations stay much closer to the 45 degree line.

Indeed when focusing on the industry level (rather than major industry groups), Figures 4a-4f show several industries with CVs for 2004 which are larger than for 1995. In China, such divergence cases include, for example, beverages, tobacco, chemicals and textiles, in addition to transport equipment for average labor compensation (Figure 4a). Increased regional inequality for labor productivity (Figure 4c) is observed, among others, for tobacco, non-ferrous metals, chemicals, in addition to transport equipment and electronics. Figure 4e shows increased inequality for unit labor cost for as many as 10 industries between 1995 and 2004, including major industries such as chemicals raw materials and fibers and metal products, in addition to transport equipment.

However, in case of India (Figures 4b, 4d and 4f), the number of industries showing an increase in inequality is much larger, and of those that show convergence only few show a substantial decline in the CV (i.e., those further to the right and below the 45 degree line in Figures 4b, 4d, 4f). In most cases, whether there is a decline or an increase in CV, both industries and industry groups are concentrated around the 45 degree line.

Finally, it is striking to see that in China the inequality at the level of industry groups or industries is much higher than for the aggregate manufacturing sector (compare marker labeled “TOT” with the industry markers). This trend towards relatively low levels in inequality of ALC, ALP and ULC at the aggregate level compared to the industry level is also supported by some of the institutional and market reforms that have taken place in China over the past decade. This has allowed regions to specialize in those industries where they have a comparatively high productivity advantage and pay high compensation levels. Standard neoclassical trade theory, however, would predict that these market reforms may also cause an equalization of compensation and productivity levels at industry levels across regions. While this may happen in due time, there is another strand of theory, that is, those based on New Economic Geography models, that would predict that greater specialization will attract higher paid resources and cause further divergence rather than convergence at industry level, and perhaps even at the aggregate level. In case of India, however, we do not see any clear trend towards lower inequality at the aggregate level, which suggests that the factor returns are not getting equalized across space and industries due to immobility of resources.

6. Conclusion

This paper focuses on comparisons of productivity, labor cost and industry-level competitiveness for the manufacturing sector of China and India. The paper builds on an ongoing research program carried out at The Conference Board and at the University of Groningen. We first provide an international comparison between India and China from a broader international perspective using industry-level output purchasing power parities (PPPs) which converts output into a common currency. We find that in recent years China showed slightly higher labor productivity level than India in year 2002, but due to its higher compensation level, China was somewhat at a disadvantage in terms of unit labor cost relative to India. This poses important questions about China’s competitiveness relative to other emerging economies, and stresses the need for keeping productivity and compensation levels in line.

In the second half of the paper, we focus on an analysis of spatial and industry differences in productivity, labor compensation and unit labor costs in China and India. Our major findings are summarized as follows. First, labor productivity and labor compensation both increased over the period of this study in China and India. However, in case of China, labor productivity in 2004 is 4 to 10 times that in 1995 and the labor compensation in 2004 is 2 to 4 times relative to its level in 1995. As a result, the unit labor cost declined by 20 to 80 percent. On the other hand, in India, the increase in labor compensation (ALC in 2002 is 1.75 to 2.75 times that in 1993) outpaced the increase in productivity (ALP in 2002 relative to 1993 is between 1 to 2 times), driving up the unit labor cost by 10 to 100 percent. Second, using a simple OLS regression framework, we observe the traditional beta convergence trend—the lagging regions or industries grow faster—in China across provinces as well as for the industry by province panel. However, this convergence trend is confirmed only for the industry by state panel in India, but not at the aggregate state level. Third, there is a clear sigma convergence at the aggregate manufacturing level taking place in China, namely, the spatial dispersion of ALC, ALP and ULC falls dramatically between 1995 and 2004. This pattern, however, is not unanimously supported by each individual industry and industry group. In India we do not find any consistent reduction in spatial disparity, even for cases that show a fall in inequality, the change is smaller compared to the change in China.

The falling inequality of ULC (as shown by the declining of the CV of ULC) suggests that ALC and ALP are more aligned across regions in China. This trend has most likely been driven by liberalization and the drive towards a market economy. As a result, inefficient activities which were carried out at the wrong place, given the large differences in gaps for comparative productivity and labor cost levels relative to the national average, have been mostly eradicated during the period of study. These transition forces, on the other hand, do not seem to be at work in India, at least not during the time period of this study. The small change in inequality (and in many cases an increase in dispersion) points to the existence of barriers to resource mobility.

Areas for Further Research

This paper ties into two major strands of theory in economics predicting the spatial distribution trends during the phase of economic development. Standard neoclassical trade theory would predict that in due time these market reforms may also cause an equalization of compensation and productivity levels at industry levels across regions. However, another strand of theory would predict that greater regional specialization will attract even more highly paid resources and cause further divergence rather than convergence at industry level, and perhaps even at the aggregate level (Krugman, 1991; Fujita, Krugman and Venables, 1999). To obtain a better understanding of the reasons for the convergence trends in manufacturing compensation, labor productivity and unit labor cost, in forthcoming work, we need to examine industry specific features, such as labor intensity, skill intensity, etc. that can potentially contribute to the convergence/divergence patterns in China and India. Preliminary analysis in a companion paper by Chen et al (2007) points at the possibility that capital and skill intensive industries have a greater tendency to concentrate spatially, so that those are not contributing much to the overall convergence trend.

Finally, it is also worthwhile to further reflect on the somewhat different perspectives on the development of comparative productivity and unit labor cost when analyzing China's and India's performance. While the unit labor cost development in India is relatively flat when expressed in U.S. dollars, we observed a significant increase in ULC when measured in national currency. This is mainly due to the fact that relative price levels (the PPP relative to the exchange rate) fell in India relative to the U.S. over this period. As a result productivity in PPP-converted US dollar relative to labor compensation went up faster than when expressed in national currency estimates. In the case of China both international and national estimates show a decline in manufacturing unit labor cost, but the decline in national currency is much faster. Again this suggests a rapid decline relative price levels in China, and lends some support to current calls for an appreciation of the yuan to other currencies.

Annex A – Basic Data for China and India regional comparisons

China

The *First Economic Census of China* was conducted by the National Bureau of Statistics in 2005 with reference to calendar year 2004.[17] The focus of the census was the non-agricultural and comparatively modern sectors of the economy, in particular industry and services. Using the average numbers of employees in 2004 from the Economic Census, there were 80.8 million employees in China's established legal manufacturing enterprises, of whom 56.67 million were in the "manufacturing enterprises of designated size and above". Enterprises of designated size and above are defined as all state-owned enterprises plus non-state-owned enterprises that had sales of 5 million yuan (about 600,000 US dollars) or more. The remaining 24.13 million were in manufacturing enterprises below designated size. Moreover the census includes another 23.8 million employees which were self-employed or in household manufacturing firms.

For 2004, we focus exclusively on the group of 56.67 million employees in enterprises of designated size and above, covering approximately 70% of total manufacturing employment in China. There are several reasons for focusing on the larger plants only, including the difficulties to estimate output and labor compensation for the other two groups. Moreover, there is no information available on a province by industry basis for enterprises other than those at designated size or above. Finally, from the perspective of competitiveness, the interest in the manufacturing firms of designated size and above (beyond 600,000 US$ sales revenue) only seems justified.

The *1995 Third National Industrial Census* consists of three volumes (by industry, region and ownership-type), plus a summary volume. It differs greatly from the 2004 Economic Census in many aspects. The most notable problem is that there has been a change in the definition of the industrial accounting unit. Up to 1998 the major subset of industries for which the industrial statistics provided extensive information was "national independent accounting industrial enterprises at and above township level". Since 1998 this has been replaced by ''all industrial state-owned enterprises (SOEs) with independent accounting system and all industrial non-SOEs with independent accounting system and annual sales revenue in excess of 5 million yuan" (the designated size and above unit). According to Holz and Lin (2001) this change implied that non-SOEs with independent accounting system at or above township level but with sales revenue of no more than 5 million yuan are now excluded from the detailed industrial statistics. On the other hand, village-level enterprises that meet the two requirements are now included (Holz and Lin (2001), p. 304, footnote 2). Even though it is not possible to make a precise assessment of the difference, it appears that "township level and above" firms covered roughly 60% of gross value of output in 1997, whereas "designated size and above" firms covered 57% of gross value of output in 1998 (Holz and Lin (2001), p. 314, figure 2), which is a sufficiently small difference to assume that these two categories of firms are reasonably comparable.

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[17] The reference time for the Economic Census was December 31st of 2004, and the flow data covered the whole year of 2004 (China NBS, 2005).

Even though both China's *Third Industrial Census* and the *First Economic Census* publish tables at the national, total manufacturing and industry levels, substantial manipulations to the data were necessary in order to estimate gross value added, labor compensation and employment because of the incomplete information of these variables in those above tables as well as the comparability in the industry coverage between these two benchmark years. For detailed data construction, see Chen et al. (2007).

India

The primary data used in this study for India comes from the Annual Survey of Industries (ASI). ASI is an annual survey of factories registered under Sections 2m(i) and 2m(ii) of the Factories Act (1948) and is the principal source of industrial statistics in India. Registered units are defined as factories employing 10 or more workers using power, and those employing 20 or more workers without using power. ASI frame is based on the list of registered factories/units maintained by the Chief Inspector of Factories in each state/Union Territory (UT). Factory (those falling under the registered manufacturing sector) is the primary unit of enumeration in the survey for the case of manufacturing industries.

ASI covers only on registered units and the unregistered manufacturing sector is not in the ambit of ASI. The survey on the unregistered sector is carried out by the National Sample Survey Organization (NSSO) and the survey is done every five years, the latest one is for July 2005-June 2006. A quick comparison using national accounts data shows that the share of registered manufacturing in total manufacturing value added is approximately 70% as of 2005-06 (share has increased from a little over 50% in 1980-81) and in terms of employment (using NSSO round 56 and ASI data for 2000-01) the registered manufacturing accounts for only 17% of the total manufacturing employment.

Deflators

Producer price indices (PPIs) by industry at the national level from the CEIC Database are used to deflate labor productivity in China. As the industry classification in CEIC is different from 28 manufacturing industries in our data set, we could only allocate 12 industry-specific indices from CEIC to the individual 28 industries for the nation as a whole.

In the case of India**,** wholesale price index (WPI) at the group/commodity level (base year 1993-94) from Ministry of Commerce and Industry (Government of India) are used for the purposes of calculating real values where needed. These deflators are not at the same level of classification as the industries. The concordance from WPI classification to the industrial classification is provided in the Appendix to a forthcoming paper on unit labor cost in India. Wherever the concordance requires aggregating WPI for several groups or commodities, respective weights (weights as used in calculation of the official overall WPI) are used in aggregation. The deflator for total manufacturing used is the weighted average of the deflators for "manufactured goods", "coal mining", and "petroleum processing".

While we do not have information on price indices for individual provinces (states) by industry, we used price indices by industry at the national level to obtain province/state level deflators, assuming that there is no variation in deflators for each industry across provinces/states. In other words, the deflators used at the All-China or All-India level for a particular industry are also used at the province or state level for that corresponding industry. This assumption is made only for the 28 industries and not for the total manufacturing at the state level.

Deflators for province/state at the total manufacturing level are calculated as the weighted average of the deflators for the 28 industries (these deflators, as discussed above, are province/state invariant across industries). Weights used are the respective value added shares of the 28 industries in the corresponding province/state.

Appendix Table 1: Comparative Levels of Labor Compensation, Labor Productivity and Unit Labor Cost, 1990-2005 (USA=100)

	Labor Compensation per Person Employed, USA=1						Labor Productivity (Mnf. Value Added per Person Employed), USA=1						Unit Labor Cost (Labor Compensation/Labor Productivity), USA=1					
	Korea	Mexico	Hungary	Poland	India	China	Korea	Mexico	Hungary	Poland	India	China	Korea	Mexico	Hungary	Poland	India	China
1990	0.236	0.128			0.030		0.296	0.168			0.126		0.797	0.763			0.241	
1991	0.260	0.144			0.029		0.310	0.167	0.158	0.156	0.113		0.837	0.858			0.255	
1992	0.263	0.159	0.149	0.090	0.021		0.321	0.161	0.163	0.163	0.104		0.819	0.985	0.914	0.550	0.207	
1993	0.288	0.161	0.156	0.088	0.027		0.339	0.157	0.185	0.155	0.111		0.849	1.023	0.841	0.564	0.240	
1994	0.318	0.146	0.152	0.096	0.025		0.350	0.156	0.198	0.147	0.113		0.908	0.934	0.767	0.650	0.222	
1995	0.398	0.080	0.160	0.117	0.024	0.021	0.374	0.152	0.220	0.154	0.120	0.059	1.064	0.523	0.728	0.765	0.203	0.365
1996	0.430	0.081	0.152	0.134	0.031		0.392	0.151	0.220	0.159	0.123		1.097	0.535	0.689	0.844	0.251	
1997	0.365	0.091	0.141	0.130	0.034		0.418	0.145	0.231	0.171	0.120		0.873	0.629	0.612	0.763	0.286	
1998	0.247	0.083	0.127	0.136	0.026		0.431	0.142	0.230	0.178	0.127		0.574	0.581	0.555	0.765	0.206	
1999	0.294	0.088	0.115	0.126	0.030		0.478	0.134	0.220	0.182	0.138		0.614	0.656	0.522	0.691	0.217	
2000	0.340	0.099	0.116	0.125	0.030		0.496	0.130	0.228	0.198	0.119		0.686	0.763	0.508	0.631	0.253	
2001	0.295	0.110	0.124	0.137	0.026		0.512	0.133	0.228	0.210	0.131		0.575	0.826	0.544	0.653	0.201	
2002	0.307	0.106	0.131	0.126	0.024	0.029	0.478	0.129	0.215	0.201	0.128	0.137	0.643	0.826	0.610	0.627	0.185	0.213
2003	0.313	0.093	0.155	0.126	0.022		0.486	0.123	0.221	0.210	0.127		0.643	0.754	0.704	0.601	0.173	
2004	0.347	0.083	0.185	0.136	0.024		0.471	0.120	0.220	0.216	0.127		0.738	0.691	0.842	0.631	0.190	
2005	0.417	0.084	0.204	0.146			0.509	0.116	0.229	0.214			0.818	0.722	0.893	0.684		

Note: Relative levels for labor compensation are exchange rate converted; relative levels for labor productivity are converted at industry-specific PPPs, using unit value approach as described in text.
Source: India: Erumban (2007, updated); China: Szirmai and Ren (2005) and Banister (2005); other countries from ICOP data, by Groningen Growth and Development Centre, available from ILO, Key Indicators of the Labor Market, 2007 (http://www.ilo.org/public/english/employment/strat/kilm/).

Appendix Table 2: Industries and Industry Groups

28 sector code	Description	8 sector classification
1	Food processing	Food Products (A)
2	Food products manufacturing	
3	Beverage manufacturing	
4	Tobacco processing	
5	Textile industry	Textiles & Clothing (B)
6	Garments and other fiber products	
7	Leather, furs, down and related products	
8	Timber, bamboo, natural fiber & straw products	Wood & Paper (C)
9	Furniture manufacturing	
10	Papermaking and paper products	
11	Printing & record medium reproduction	
12	Cultural, educational, and sport products	
13	Petroleum processing and coking products	Chemicals (D)
14	Chemical raw materials & products	
15	Medical & pharmaceutical products	
16	Chemical fibers manufacturing	
17	Rubber products	
18	Plastic products	
19	Nonmetal mineral products	Metal Products (E)
20	Smelting & pressing of ferrous metals	
21	Smelting & pressing of nonferrous metals	
22	Metal products	
23	Ordinary machinery manufacturing	Machinery (F)
24	Special purpose equipment manufacturing	
26	Electric equipment and machinery	
25	Transportation equipment manufacturing	Transpo-rtation equipme-nt (G)
27	Electronics and telecommunications	Electronics (H)
28	Instruments & stationery machine tools	

Appendix Table 3a: Provinces and Regions – China

Provinces	7 Regions
Beijing	Bohai
Tianjin	
Hebei	
Shandong	
Shanghai	SouthEast
Jiangsu	
Zhejiang	
Fujian	
Guangdong	
Liaoning	NorthEast
Jilin	
Heilongjiang	
Anhui	Central
Jiangxi	
Henan	
Hubei	
Hunan	
Guangxi	SouthWest
Hainan	
Sichuan	
Guizhou	
Yunnan	
Shanxi	NorthWest
Inner Mongolia	
Shaanxi	
Gansu	
Qinghai	
Ningxia	
Xinjiang	
Tibet	Tibet

Appendix Table 3b: States and Region

New State	Old State	State/UT	Code	Main State	Region
Chandigarh	Chandigarh	UT	CH	No	North (N)
Delhi	Delhi	UT	DL	Yes	
Haryana	Haryana	State	HY	Yes	
Himachal Pradesh	Himachal Pradesh	State	HP	No	
Jammu & Kashmir	Jammu & Kashmir	State	JK	No	
Punjab	Punjab	State	PJ	Yes	
Bihar	Bihar	State	BH	Yes	East (E)
Jharkhand (JD)		State			
Orissa	Orissa	State	OR	Yes	
West Bengal	West Bengal	State	WB	Yes	
Chattisgarh (CT)	Madhya Pradesh	State	MP	Yes	Central (C)
Madhya Pradesh		State			
Uttar Pradesh	Uttar Pradesh	State	UP	Yes	
Uttaranchal (UL)		State			
Dadra & Nagar Haveli	Dadra & Nagar Haveli	UT	DN	No	West (W)
Daman & Diu	Daman & Diu	UT	DU	No	
Goa	Goa	State	GA	No	
Gujarat	Gujarat	State	GJ	Yes	
Maharashtra	Maharashtra	State	MH	Yes	
Rajasthan	Rajasthan	State	RJ	Yes	
Andaman & N. Island	Andaman & N. Island	UT	AN	No	South (S)
Andhra Pradesh	Andhra Pradesh	State	AP	Yes	
Karnataka	Karnataka	State	KK	Yes	
Kerala	Kerala	State	KL	Yes	
Pondicherry	Pondicherry	UT	PY	No	
Tamil Nadu	Tamil Nadu	State	TN	Yes	
Assam	Assam	State	AS	Yes	North East (NE)
Manipur	Manipur	State	MN	No	
Meghalaya	Meghalaya	State	MG	No	
Nagaland	Nagaland	State	NG	No	
Tripura	Tripura	State	TR	No	

References

Annual Survey of Industries, 2007, "A Data Base on the Industrial Sector in India (1973-74 to 2003-04)", Vol. II, Economic and Political Weekly Research Foundation (EPWRF).

Ark, Bart van, 1993, "International Comparisons of Output and Productivity", Monograph Series No. 1, Groningen Growth and Development Centre (http://www.eco.rug.nl/GGDC/ThesisArk.html).

Ark, Bart van, Judith Banister, and Catherine Guillemineau, 2006, "Competitive Advantage of "Low-Wage" Countries Often Exaggerated", Executive Action Series, No. 212, (October).

Banister, Judith, 2005, "Manufacturing Earning and Compensation in China," *Monthly Labor Review*, (August), pp. 22-40.

Chen, Vivian, Bart van Ark , Harry Wu, and Qin Xiao, 2007, "The Convergence of Provincial Unit Labor Cost in China, 1995 and 2004", The Conference Board, paper presented at IARIW-NBS International Conference on Experiences and Challenges in Measuring National Income and Wealth in Transition Economies, (September), Beijing.

Erumban, Abdul Azeez, 2007, "Productivity and Unit Labor Cost in Indian Manufacturing: A Comparative Perspective", GGDC Research Memorandum GD-96, Groningen Growth and Development Centre, University of Groningen.

Fujita, M., P. Krugman, and A.J. Venables, *The Spatial Economy: Cities, Regions, and International Trade*, Cambridge Mass, MIT Press.

Krugman, P., 1991, "Increasing Returns and Economic Geography", *Journal of Political Economy*, volume 49, pp. 137-150.

Lee, Boon L,, D. S. Prasada Rao and William Shepherd, 2007, "Comparisons of Real Output and Productivity of Chinese and Indian Manufacturing, 1980-2002", *Journal of Development Economics* , Volume 84, Issue 1, pp. 378-416, (September).

Maddison, Angus and Bart van Ark, 2002, "The international comparison of real product and productivity", in A. Maddison, D.S. Prasada Rao and W.F. Shepherd, eds., The Asian Economies in the Twentieth Century, Edwar Elgar, Cheltenham, pp. 5-26.

Szirmai, A. and R. Ren, 2000, "Comparative Performance in Chinese Manufacturing, 1980-92", *China Economic Review*, 11 (1), pp. 16-53.

Szirmai, A., R. Ren and M. Bai, 2005, "Chinese Manufacturing Performance in Comparative Perspective, 1980-2002," Working Papers 920, Economic Growth Center, Yale University.

Timmer, M. P., 2000, *The Dyanmics of Asian Manufacturing: A Comparative Perspective in the late Twentieth Century*, Edward Elgar, Cheltenham.

Wan, G., 2007, "Understanding Regional Poverty and Inequality Trends in China: Methodological Issues and Empirical Findings", *Review of Income and Wealth*, Series 53, Number 1.

Wu, Harry X., 2001, "China's Comparative Labor Productivity Performance in Manufacturing, 1952-1997: Catching Up or Falling Behind?" *China Economic Review*, 12, pp. 162-189.

Wu, Harry X., Boon L. Lee, and D. S. Prasada Rao, 2007, "Comparative Performance of Indian and Chinese Manufacturing Industries, 1980-2004", paper presented at IARIW-NBS International Conference on Experiences and Challenges in Measuring National Income and Wealth in Transition Economies, Beijing, (September).

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